4.6 NOISE

4.6.1 Environmental Setting

4.6.1.1 Noise Characteristics

Noise is defined as "unwanted sound." It consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. At undesirable levels, pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is a function of the number of complete vibrations, or individual sound waves, striking our ears per unit of time. As this number measured in hertz; i.e., cycles per second, increases, we hear a rising pitch; as it drops off, we hear a deepening pitch.

Loudness is a function of the amount of energy in a sound wave. This energy is, in turn, a function of sound pressure. A sound wave consists of a moving front of pressure that exceeds the ambient atmospheric pressure, followed by a trough that is below ambient atmospheric pressure. The more this pressure front varies from the ambient pressure, the louder, or more intense, the sound. Loudness also depends on other factors, as discussed below. Whether or not a given sound is perceived as too intense depends upon the reception characteristics of the listening ear. The ear is tuned to receive sound that is within a specific intensity range. Sound below that range is inaudible, while sound above that range becomes painful and damaging to the ear. Intensity, like pitch, can be precisely measured with instruments.

4.6.1.2 Noise Scales

Sound intensity is measured in units called decibels (dB). When this basic unit is adjusted to correct for the relative frequency response of the human ear, the resulting unit is the "A-weighted" decibel (dBA). The A-weighted frequency correction correlates overall sound pressure levels with the frequency response of the human ear. In addition, the equivalent noise level (Leq) is the average noise level on an energy basis for a specific time-period. The duration of noise and the time of day at which it occurs are important factors in determining the impact of noise on communities. Noise is more disturbing at night and noise indices have been developed to account for the time of day and duration of noise generation. The Community Noise Equivalent Level (CNEL) and Day-Night Average Level (DNL or L_{dn}) are such indices. These indices are time-weighted average values equal to the amount of acoustic energy equivalent to a time-varying sound over a 24-hour period. The CNEL index penalizes night-time noise (10 p.m. to 7 a.m.) by adding 10 dB and evening noise (7 p.m. to 10 p.m.) by adding 5 dB to account for increased sensitivity of the community after dark. The L_{dn} index penalizes night-time noise the same as the CNEL index, but does not penalize evening noise. The following Table 4.6-1 summarizes typical community noise exposure and acceptability for various land uses.

Table 4.6-1. Land Use Compatibility for Community Noise Environments

Land Use Category	Community Noise Exposure Ldn or CNEL, dBA						
	55	60	65	70	75	80	
Residential: Low-density Single Family, Duplex, Mobile Homes							
Residential: Multiple Family							
Transient Lodging: Motels, Hotels							
Schools, Libraries, Churches, Hospitals, Nursing Homes							
Auditoriums, Concert Halls, Amphitheaters							
Sports Arena, Outdoor Spectator Sports							
Playgrounds, Neighborhood Parks							
Golf Courses, Riding Stables, Water Recreation, Cemeteries							
Office Buildings, Business Commercial and Professional							
Industrial, Manufacturing, Utilities, Agriculture							

Source: California Department of Health, Office of Noise Control

INTERPRETATION:

	Normally Acceptable: specified land use is satisfactory, based upon the assumption that any buildings involved are of normal construction without any special noise insulation requirements.
	Conditionally Acceptable: New construction or development should only be undertaken after a detailed analysis of the noise reduction requirements is made and the needed insulation features included in the design.
	Normally Unacceptable: New construction or development should generally be discouraged. If new development is to proceed, a detailed analysis of the noise reduction requirements is made and the needed insulation features included in the design.
	Clearly Unacceptable: New development or construction should not be undertaken.

The decibel level of a sound decreases exponentially as the distance from the source increases. For a single point source, sound level decays approximately 6 dB for each doubling of distance from the source. If noise originates from a linear, or "line" source, such as a traffic or rail corridor, the sound will decrease 3 dB for each doubling of distance, provided the surrounding environment is "hard" (free from "soft," sound-absorbing objects such as vegetation). Noise from a line source in an environment that is relatively flat and well vegetated will decrease 4.5 dB for each doubling of distance.

Sound measurements in water differ from those in air. In water, the metric is expressed as decibel, but the standard reference level is 1 microPascals (µPa). In air, the standard reference level is 20 µPa. As a result, a sound measurement in water is reduced by approximately 63 dB when converted to an air measure. Of this 63 dB difference, 26 dB is attributable to the two different sound scales. The remainder relates to differences in the density and compressibility of air and water. For example, a sound level of 125 dB in water is equivalent to approximately 65 dB in air, which is the level of a normal conversation.

The time of day when a sound is emitted is an important factor in determining whether or not it is considered a nuisance. Sounds that may be barely noticeable at midday may be seriously disruptive at midnight. A number of measurement scales that attempt to account for this time factor have been developed. The L_{dn}, which was developed by the U.S. Environmental Protection Agency (EPA), is a 24-hour average sound level in which a 10 dBA penalty is added to any sounds occurring between the hours of 10:00 p.m. and 7:00 a.m. The CNEL scale, which is used in California Airport Noise Regulations, is similar except that an additional 5 dBA penalty is added for the evening hours from 7:00 p.m. to 10:00 p.m. L_{dn} and CNEL values are calculated from sound-equivalent values (L_{eq}), which are average sound energy values in dBA averaged over a period of time, generally one hour.

4.6.1.3 Sensitive Receptors

The Goleta Community Plan (Santa Barbara County 1995a) identifies a number of land uses that are considered to be sensitive noise receptors by Santa Barbara County. These receptors include residences, hotels, motels, hospitals, nursing homes, schools, libraries, and churches. Because of the sensitivity of these land uses to noise disturbance, they have more stringent noise exposure targets than manufacturing or agricultural uses, which are not subject to impacts such as sleep disturbance. Sensitive receptors occurring in the vicinity of the project site include the Bacara Resort and Spa located approximately 0.75 mile (1.2 km) northwest of the project site; the Ellwood Elementary School located 2 miles (3.2 km) north of the project site; the Isla Vista Elementary School located about 2 miles (3.2 km) northeast of the project site; and two residential developments located 0.5 mile (0.8 km) northeast and 0.75 mile (1.2 km) east of the project site, respectively.

Primary noise sources identified in the project area include overflying jet and propeller aircraft operating from the Santa Barbara Municipal Airport located approximately 3.5 miles (5.6 km) east of the project site; Southern Pacific Railroad operations located 3,700 feet (1,127.7 m) north of the project site; vehicle traffic on U.S. 101 and major arterial roadways located a minimum of 3,200 feet (975.4 m) north of the project site; and Venoco's Ellwood Onshore

Facility located 4,000 feet (1,219.2 m) west of the project site. However, surf-related noise is the dominant noise source in the immediate vicinity of the project site. Typical noise levels along the coast are approximately 62 dBA (ADL 1984). Railroad noise can be expected to be 60 dBA or greater within 600 feet (182.9m) of the tracks; similar levels result from highway (U.S. 101) traffic within 250 to 600 feet (76.2m to 182.9m) (Santa Barbara County 1986).

4.6.1.4 Existing Ambient Noise Levels

In order to characterize the noise environment around the project site, ambient noise measurements were sampled during the late morning to early afternoon on May 23 and May 24, 2001, at six locations (Table 4.6-2 and Appendix N, *Ambient Onshore Noise Levels*). Noise levels at these locations were generally low, ranging from 53.8 dBA at the Sandpiper Golf Course to 66.3 dBA at the Ellwood Onshore Facility Pier, on which construction activities were occurring and approximately 40 feet (12.2m) from the shorebreak. These levels were consistent with the noise contour levels mapped for the project site in the Community Plan (Santa Barbara County 1995a), which were between 60 and 64 dBA CNEL. Noise levels recorded at the six locations are expected to be fairly consistent throughout the day and slightly lower at night due to reduced traffic levels and cessation of construction activities at the onshore pier.

Table 4.6-2. Existing Noise Levels[1] in Vicinity of Proposed PRC-421 Pier Removal Project Site

Location	Number[2]	L_{eq}	Noise Sources	Distance to Sources
Bluff above Ellwood Beach between Coal Oil Point and Santa Barbara County Shores Park	1	57.6 dBA	Shorebreak, airplanes, birds	300 feet(91.4m)
Bluff edge above beach - 13th Green at Sandpiper Golf Course	2	59.3 dBA	Shorebreak, birds, airplanes, traffic (Hwy 101 and Hollister)	200 feet(60.9m)
Bluff edge above beach - 13th Tee at Sandpiper Golf Course	3	53.8 dBA	Shorebreak, airplanes, Ellwood Onshore Facility, birds, wind	200 feet(60.9m)
Bacara Resort beach access trail - at edge of beach	4	53.9 dBA	Shorebreak, chainsaw, train, train whistle	150 feet(45.7m)
Bluff edge on 13th fairway at Sandpiper Golf Course - Due north of Bird Island	5	60.6 dBA	Shorebreak, Venoco onshore pier, planes, birds, wind.	150 feet(45.7m)
Haskell's beach - 100 feet (30.5m) west of Venoco Onshore pier 421-1	6	66.3 dBA	Shorebreak, Venoco onshore pier	40 feet(12.2m)
Residential Area	7	58.0 dBA	Traffic, birds	400 feet(12.2m)

[2] See Figure 4.6-1 for noise measurement locations.

[1] Based on 15-minute sampling episodes using a Larson Davis DSP80 Sound Meter (see Appendix N). Updated short-term ambient noise measurements were taken on September 25, 2003 at the locations identified above. No substantial change in ambient noise conditions from those presented above were noted (see Appendix N)

4.6.1.5 Applicable Plans, Policies and Regulations

Principal policies applicable to this section were derived from federal, State, and county laws and regulations. These policies were also used as the basis for significance thresholds (see Section 4.6.2.2 below). The policies include the following:

1. Article 4 of the California Administrative Code (California Noise Insulation Standards, Title 25, Chapter 1) requires noise insulation in new hotels, motels, apartment houses, and dwellings (other than single family detached housing) or provide an annual average noise level of no more than 45 dBA CNEL. When such structures are located within a 60 dBA CNEL (or greater) noise contour, an acoustical analysis is required to assure that interior levels do not exceed the 45 dBA CNEL annual threshold.
2. The Federal Housing Administration establishes a 65 dBA L_{dn} standard for the exterior of single-family residences. If external standards are between the 65 dBA L_{dn} standard and the 75 dBA L_{dn}, acoustical analysis is required to insure that the interior standard is met. Residential development is unacceptable where exterior noise levels exceed 75 dBA L_{dn}.
3. Santa Barbara County has based its noise control policies on existing state and federal noise standards and policies (Santa Barbara County 1986). They conclude that a 65 dB Day-Night Average Sound Level (L_{dn}) should be regarded as the maximum exterior noise exposure compatible with noise-sensitive uses. According to the *Santa Barbara County Comprehensive Plan Noise Element* (cited in *County of Santa Barbara Environmental Thresholds Manual* 1995b), without mitigation, exterior daytime and nighttime noise levels associated with grading and construction activity within 1,600 feet (487.7m) of sensitive receptors, including schools, residential development, commercial lodging facilities, hospitals or care facilities, would generally be considered to result in a potentially significant impact.

4.6.2 Impacts and Mitigation Measures

This section analyzes impacts associated with the Proposed Project. Removal of the pier, and installation of the roosting/nesting platforms will result in the generation of noise that will affect the local environment. Principal noise sources will include heavy equipment operations, including tug and workboats, subsurface detonation of high explosives and pile-driving. These impacts will be short-term during the demolition of the existing structures and construction of the proposed roosting/nesting platforms. A noise analysis was conducted to determine the effect of the Proposed Project on sensitive receptors. The analysis for this section focuses on impacts on humans. See Section 4.4 for a discussion of noise impacts on marine life.

4.6.2.1 Methodology

The prediction of noise levels and estimation of impacts at receptor points near the Proposed Project depends upon three factors: 1) the location and type of project equipment

that generate noise; 2) distances between the project noise sources and sensitive receptors; and, 3) obstacles or barriers to sound propagation between the source and receptors.

Data on noise levels from the construction equipment were used in noise models to estimate the project generated L_{eq} (Appendix O, *Anticipated Onshore Noise Levels*). The equipment necessary for project completion is listed in the Project Description (Section 3.5). Noise emission factors for the supply and crew boats were obtained from the *Subsea Well Abandonment and Flowline Abandonment Removal Program, Final EIR* (Continental Shelf Associates, Inc., 1995); tug boat and derrick barge noise emission factors were obtained by taking direct measurements of operating vessels; noise emission factors for aircraft were obtained from the EPA noise guidelines (EPA 1971), and noise levels associated with pile drivers was taken from a technical data sheet from Delmag (2003). Table 4.6-3 shows the noise level ranges at 50 feet (15.2m) from the source for the type of equipment associated with the pier removal project. These levels are similar to other kinds of construction equipment (see Appendix O, Anticipated Onshore Noise Levels).

Table 4.6-3. Noise Levels at 50 Feet (15.2m) from Typical Project Equipment

Equipment Type	Noise Level at 50 Feet(15.2m) (dBA)
Supply Boat	92.0
Crew Boat	88.0
Tug Boat	82.1
Derrick Barge/Dive Service Vessel	81.5
Airplane	85.0
Pile Driver	112.0

The noise levels from the equipment sources were combined to produce a project noise emission value that would emanate from the construction site (see Appendix O, *Anticipated Onshore Noise Levels*) under two operational scenarios, removal of the pier remnant topsides and the pile driving phase of roosting/nesting platform construction. The values were then decreased by 6 decibels for every doubling of distance between the project site and five monitoring locations (depicted on Figure 4.6-1) that represent nearby receptors. The final distance-attenuated noise values were added to the ambient noise level at each monitoring location to determine the both the worst-case noise level associated with the Proposed Project,

NOISE MEASUREMENT LOCATIONS
FIGURE 4.6-1

Backside of 4.6-1

and the incremental increase in noise attributable to the Proposed Project (Table 4.6-4). No noise reduction was attributed to barriers and/or obstructions.

4.6.2.2 Definition and Use of Significance Criteria

The significance of a noise effect is evaluated on compliance with regulations, which involves: 1) consistency with permissible noise levels on sensitive receptors based on specific land use; 2) permissible changes in noise levels relative to measured baseline levels; and 3) maximum permitted noise levels for a jurisdiction.

Appendix G of the State CEQA Guidelines (California Governor's Office of Planning and Research 2001) indicates that a project will normally result in a significant adverse impact if it causes "a substantial temporary or periodic increase in ambient noise levels in the project vicinity above noise levels existing without the project."

The evaluation criteria listed below were used to assess whether a "substantial increase" in ambient noise would occur as a result of the Proposed Project. Noise impacts from the Proposed Project would be considered significant if sensitive noise receptors were exposed to project-generated noise that exceeded relevant federal, State, or local standard or regulations (see Section 4.6.1.5 above for additional detail):

1. Article 4 of the California Administrative Code (California Noise Insulation Standards, Title 25, Chapter 1): interior level of 45 dBA annual average when dwelling is in a 60 dBA or greater zone.
2. The Federal Housing Administration: 65 dBA L_{dn} standard for the exterior of single-family residences.
3. *Santa Barbara County Comprehensive Plan Noise Element* (cited in Santa Barbara County 1995b): 65 dBA L_{dn} should be the maximum exterior noise exposure compatible with noise-sensitive uses

Because the project is a short-term construction project and would not result in any land use change, Item 3 above is the applicable noise level standard, following the guidance for grading and construction in the *Santa Barbara County Comprehensive Plan Noise Element* (cited in Santa Barbara County 1995b). Proposed Project noise that would not be attenuated to this level at the receiving sites would be considered to be significant. Further, the *County of Santa Barbara Environmental Thresholds Manual* (1995b) indicates that short-term noise impacts, such as those that would occur during the construction activities, can typically be reduced to less than significant levels, provided that pre-mitigation noise levels would not exceed 95 dBA at a distance of 50 feet (15.2m) from the noise source(s). The document's Noise Element states, "According to EPA guidelines, average construction noise is 95 dB(A) at a 50 feet (15.2m) distance from the source. A 6 dB drop occurs with a doubling of the distance from the source. Therefore, locations within 1,600 feet (487.7m) of the construction site would be affected by noise levels over 65 dB(A). To mitigate this impact, construction within 1,600 feet (487.7m) of sensitive receptors shall be limited to weekdays between the hours of 8 AM to

5 PM only. Noise attenuation barriers and muffling of grading equipment may also be required. Construction equipment generating noise levels above 95 dB(A) may require additional mitigation." (Santa Barbara County 1995b).

4.6.2.3 Impact of Project Noise

Short-term Impacts. The following are the potential impacts occurring during the demolition and recovery phase of the Proposed Project.

NOI-1: Mobilization, demolition, recovery, construction and de-mobilization activities will result in increased daytime noise levels.

Discussion:

Short-term noise impacts will occur in phases throughout the project area.

The initial phase is mechanical removal of top structure deck members and associated debris from scaffolding installed on caissons, exposure of the 4 H-beams at the base of each of the caissons, and loading of debris onto support vessel using the crane. Noise associated with the first phase will include the operation of vessels, oxy-acetylene cutting and rigging equipment, 25-ton crane, and associated components as described in Section 3.0 of this EIR, Project Description.

The next phase of project activities would include the toppling and positioning of the caissons and preparation of the site for installation of quarry rock. The primary activity for this phase is the use of explosives for toppling of the caissons. This issue is discussed later in this section under NOI-2.

Pier removal activity would continue with recovery operations to remove all remaining debris from the project site; inspection of all caisson H-Beams to ensure that cuts were made at or below the mudline; cutting/recovery of all remaining pilings between remnant pier and shore; and survey of entire demolition area to ensure removal of all debris items. Noise associated with this phase will include use of the LLB and associated components, mechanical recovery equipment, oxy-acetylene cutting equipment, ROV equipped with video and sonar capabilities, and all vessels transporting back to the harbor.

After recovery operations the Proposed Project would continue with the installation of the bird roosting/nesting platforms which would include driving the piles that would support the roosting/nesting platforms. The pile driving would be the highest noise producing activity. Noise associated with the pier removal project will vary as a function of the number and type of equipment as well as time, frequency, and duration of use. Local environmental factors and distance to sensitive receptors will also play a role in noise impacts. Because of atmospheric attenuation of spherically radiating point noise source, levels are reduced by a factor of 6 dBA for every doubling of distance. Consequently, most equipment noise would drop below 60 dBA at about 1,000 feet (304.8m) away from the source.

Hardbottom substrate would then be added to the toppled caissons. Quarry rock will be brought to the site aboard barges and will be deposited using an articulated CAT 98F loader. The Applicant proposes that a concrete-decked barge shall be used for the quarry rock in order to reduce the noise that would be associated with moving the rock across steel (Section 4.5 of the *Wildlife Protection Plan*, Appendix J).

Table 4.6-4. Anticipated Noise Levels during Pier Removal and Roosting/Nesting Platform Construction

Receptor Location	Number[1]	Ambient[2] (L_{eq} dBA)	Ambient Plus Project[3] (Removal)(L_{eq} dBA)	Ambient Plus Project[3] (Pile Driving) L_{eq} dBA	Distance from Project Site (feet)
Haskell's Beach	6	66	71	85	850
Sandpiper Golf Course	2, 3, 5	54	68	83	1,000
Residential Area	7	58	62	75	2,600
Santa Barbara County Shores Park	1	58	61	74	3,000
Bacara Resort	4	54	58	71	4,000

1 See Figure 4.6-1 for locations.
2 See Appendix N, *Ambient Onshore Noise Levels*
3 See Appendix O, *Anticipated Onshore Noise Levels*

Table 4.6-4 is an estimate of the noise levels generated by project equipment and the corresponding increase over ambient levels at several receptor locations near the project area. The potential sensitive receptors in the project area are the Bacara Resort to the northwest and the residential areas to the east; however, because of the distances from the project site, noise levels at these locations would be below the 65 dBA level for construction activities. Consequently, during most of the 26 day demolition and construction period the only people affected by the noise levels in exceedance of the 65 dBA threshold would be potential recreational boaters, visitors at Haskell's Beach, and golfers at the Sandpiper Golf Course within about 2,000 feet (609.6m) of the project site. However, as can be seen on Table 4.6-4, the pile driving element of the project would result in increases in ambient noise levels ranging from 16 to 29 dBA for the locations monitored and modeled. This activity is anticipated to occur for only two days of the approximate 26 day demolition and construction period.

Impact/Mitigation:

Because construction activities could result in an exceedance of County noise standards for noise sensitive uses (residential and motel uses) during the two days of pile driving, this short-term impact may be considered significant, but mitigable (Class 2).

Mitigation Measure NOI-1:

- Consistent with County thresholds, construction activities shall be confined to the period between 8:00 a.m. and 5:00 p.m. on weekdays during the pile driving phase of the Proposed Project.

NOI-2: The detonation of underwater explosives to topple pier caissons will increase noise levels in the project area.

Discussion:

As described above, the toppling of the existing caissons would require sequential detonation of explosives attached to pier caissons to topple the eight caissons. Noise associated with this phase will include an airplane conducting pre-detonation wildlife surveys, noise associated with DSV winches to move from explosion area, and detonation of the explosives. As currently planned, a total of 7.2 pounds of explosive will be used per caisson. All eight caissons will be detonated in rapid succession.

At the Seacliff Pier Complex Decommissioning Project, up to 100, five-pound charges were detonated sequentially separated by milliseconds in 25 feet (7.62 m) of water. An observer on a workboat within 150 to 300 feet (45.72 m to 91.4 m) of the pier heard a dull thud, and on windy days, the detonations were inaudible (S. Poulter, Padre, pers. comm. 2001). The removal of Platform Hilda was accomplished using 35-lb charges in 80 feet (24.4 m) of water. The resultant explosion was compared to a shotgun blast from several hundred yards away (Tom Kennedy, Fairweather Marine, pers. comm. 2001). Based upon anecdotal evidence of larger detonations at shallower depths, coupled with the distance from sensitive receptors on shore, the noise level is expected from the pier removal would be the equivalent of a shotgun blast from several hundred feet.

Impact/Mitigation:

Because of the short-term nature of the Proposed Project, the short duration of the impact (each detonation less than a second), the limited number of denotations, the timing of the detonations during the day, and the frequency of the detonations, this impact is not expected to be a significant impact (Class 3). However, the following measure is recommended as a service to those in the project area.

Mitigation Measure NOI-2:

- The affected public shall be notified in advance of the detonations in order to reduce potential disturbance/annoyance. Notification shall include placing warning signs at ingress points to Haskell's Beach, at the Sand Piper Pro Shop, at the Bacara Resort, and in the County Parks. The signs shall indicate that a total of eight denotations will occur in rapid succession, the construction window, and the estimated intensity/loudness of the detonations. The signs will note that explosions will be preceded by a warning sound (the sound will be defined before project construction

to ensure that it is unique from other warning devises used in the area at that time) from the workboat at the pier.

Long-term Impacts.

NOI-3: Long-term maintenance of the proposed bird roosting/nesting platforms would result in minimal noise producing activity.

Discussion:

Infrequent, once every few years, maintenance activities would be required at the roosting/nesting platforms. Noise producing aspects of such maintenance activity are expected to be limited to use of boats to access the site. No unusual noise producing equipment is required.

Impact/Mitigation:

Long-term project-related noise impacts would likely not be noticeable from ambient conditions and are not significant (Class 3). Therefore, no mitigation is required.

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